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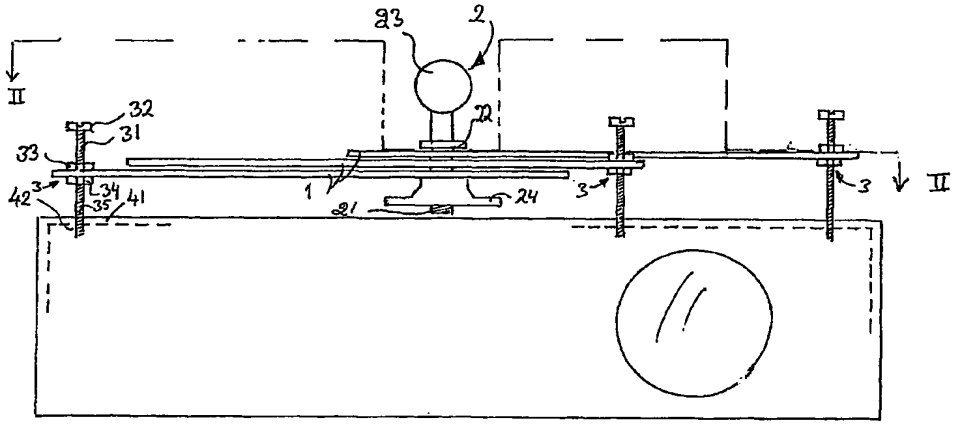
Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,*

[Continued on next page]

(54) Title: A PROJECTOR HOLDER



(57) Abstract: A projector holder comprising a connecting element (2) which includes a coupling element (23) for connection of the projector holder to a supporting structure, and at least three arms (1) which are carried by the connecting element for rotation about mutually parallel axes and for radial displacement relative to said axes, so that a first end (10) of the arms (1) can be brought into alignment with threaded openings (42) in a wall (41) of a projector housing, wherein each arm (1) carries a coupling device (3) for connecting said first end of a respective arm to a nearby threaded opening (42) in the wall of said housing, and wherein the connecting element (2) is adapted to releasably secure the second end portions (12) of the connected arms. The coupling device (3) includes a screw (31) which extends through an opening (11) through the first end portion (10) of a respective arm (1) with a given degree of clearance, and two nuts (33, 34) which co-act with the thread on the screw (31) and each of which is mounted on a respective side of said arm (1), wherein the thread on the screw (31) is able to co-act with the thread in the opening (42) of the projector housing wall, such as to enable the screw (31) to be screwed to a desired depth in threaded openings (42) in said housing wall (41), wherein the nuts (33, 34) can be moved along the screw (31) in a manner to locate the arm (1) at a chosen distance from the housing wall (41) and such as to be tightened against said arm and therewith secure the screw (31) against rotation.

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CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A PROJECTOR HOLDER

The present invention relates to a projector holder of the kind defined in the preamble of the accompanying Claim 1.

Typical video projectors include a number of threaded openings in at least one of the walls of the projector housing, for instance in the top or the bottom housing wall.

This enables the projector to be connected readily to an object, for instance a projector holder, by means of screws that engage with the threaded openings.

In turn, the projector holder includes a connecting element, for instance a ball coupling, which allows the holder, and also the projector stably connected to the holder, to be connected to a supporting structure.

The threaded openings in the wall of the projector housing are normally located at mutually different levels and at different distances apart in the many different commercially available projector models. The projector holder includes a number of straight elongate arms and a device by means of which the arms can be mutually joined and which includes a coupling device by means of which the projector holder can be connected to a supporting structure. This allows a first end of each arm to be placed over a respective threaded opening in the wall of the projector housing and connected to said wall with the aid of a connecting element.

The other end of respective arms is suitably slotted. The arms will typically include mutually parallel opposing surfaces and are placed so that their slotted or fork-shaped ends cross one another in an arm stack, wherein the connecting element includes a screw joint whose screw extends through the fork-shaped or slotted ends of the arms. The effective length and the direction of said arms from the connecting element can therewith be readily adjusted and the screw joint then tightened. The screw joint may, for instance, include a so-called finger-manipulated nut.

The connection between the first end of an arm and the corresponding threaded opening in the housing must be rigid and, for instance, be able to take-up both compression and

tension forces. The connection must also be able to provide a desired effective length and also a non-rotatable connection of a forward threaded part to the threaded opening of the housing. In this regard, the forward threaded part must not protrude particularly far into the housing, so as to avoid the risk of damaging components in the housing. It will preferably be possible to establish the connection with the aid of standard elements, and preferably with the aid of simple screws, which although preferably having a standard length will nevertheless fit many different projector models that have threaded openings of corresponding diameter and thread systems. Because different projector models have threaded openings of mutually different diameters and/or thread systems, the first ends of said arms cannot include a thread for screw connections, for practical reasons.

Accordingly, an object of the present invention is to provide a projector holder of the aforesaid kind that has a simple and effective connection between the first end of respective arms and a threaded opening in the wall of the projector housing that is in alignment with said first end, wherewith the connection shall be readily adjustable with regard to the distance between said first end and said threaded opening.

A further object of the invention is to provide connections that are based on standard elements.

These objects are achieved by means of the invention.

The invention is defined in the accompanying independent Claim 1.

Further embodiments of the invention will be apparent from the accompanying dependent Claims.

Basically, the invention involves establishing each connection with the aid of a long screw which is inserted with play through an opening in the first end of an arm. The screw carries a nut on each side of the arm. The forward end of the screw is screwed through a short distance into the threaded wall opening of the projector housing. The nuts can then be rotated on the screw so as to establish a chosen distance between the opening of the projector housing and the nuts/said arm end, whereafter the nuts are tightened against the arm, therewith locking the screw against rotation in relation to both the arm opening and

the wall opening of the projector housing. The screw may typically include a head that has a screw driving formation, for instance a screwdriver slot, so as to facilitate driving of the forward end of the screw into the threaded opening of the housing wall.

The holder connecting element can normally be displaced in a plane normal to the screws so that its fastener element (for instance ball coupling or a screw fastener) can be moved to a chosen position relative to the projector housing, whereafter the connecting element is tightened.

The connections can thus be established with the aid of standard elements and are able to bridge varying distances between the end of respective arms and the nearby threaded opening of the projector housing wall. It is also possible to control the depth to which the screw is screwed into the threaded opening. The screw can also be locked against rotation in relation to the projector housing and said end of a respective arm with the aid of said pair of nuts.

The invention will now be described by way of example with reference to the accompanying drawing.

Fig. 1 is a schematic illustration of a projector holder mounted on a projector.

Fig. 2 illustrates schematically a sectioned view taken on the line II-II in Fig. 1.

Fig. 1 illustrates a video projector 4 whose upper housing wall 41 includes a number of threaded openings 42.

The openings 42 have screwed therein the threaded forward end portion 35 of a screw 31 belonging to a projector holder that includes at least three arms 1 which can be connected mutually to a connecting element 2. Each arm has a first end 10 that includes a drilled hole 11 which receives the screw 31 with a given degree of clearance.

The screw includes a nut 33, 34 on a respective side of the arm 1. The distance between said one end of a respective arm and the threaded opening 42 of the projector 4 can be fixedly adjusted, by screwing the nuts 33, 34 along the screw 31. The screw can be secured

against rotation relative to the arm and to the threaded opening 42 of the projector housing, by tightening the nuts 33, 34 against said arm. A lock washer or locking plate may optionally be placed between the arm and a respective nut. The screw has a head 32 that includes a screw-driving formation, for instance a screwdriver slot. As will be seen from Fig. 2, the arms 1 include an elongate slot 13 at least at their other ends 12. The slots 13 receive a screw 21 included in the connecting element 2. The connecting element 2 includes a clamping plate 22 at one end of the screw 21. The clamping plate 22 carries a coupling element 23, which has the form of a ball coupling in the illustrated case. Alternatively, the coupling element 23 may have the form of a coupling screw or a fitting for mounting the projector holder to a supporting structure.

The connecting element 2 can be loosened and tightened respectively with the aid of a nut 24 in the form of a finger manipulated knob.

CLAIMS

1. A projector holder comprising a connecting element (2) which includes a coupling element (23) for connection of the projector holder to a supporting structure, and at least three arms (1) which are carried by the connecting element for rotation about mutually parallel axes and for radial displacement relative to said axes, so that a first end (10) of the arms (1) can be brought into alignment with threaded openings (42) in a wall (41) of a projector housing, wherein each arm (1) carries a coupling device (3) for connecting said first end of a respective arm to a nearby threaded opening (42) in the wall of said housing, and wherein the connecting element (2) is adapted to releasably secure the second end portions (12) of the connected arms, **characterised** in that the coupling device (3) includes a screw (31) which extends through an opening (11) through the first end portion (10) of a respective arm (1) with a given degree of clearance, and two nuts (33, 34) which co-act with the thread on the screw (31) and each of which is mounted on a respective side of said arm (1), wherein the thread on the screw (31) is able to co-act with the thread in the opening (42) of the projector housing wall, such as to enable the screw (31) to be screwed to a desired depth in threaded openings (42) in said housing wall (41), wherein the nuts (33, 34) can be moved along the screw (31) in a manner to locate the arm (1) at a chosen distance from the housing wall (41) and such as to be tightened against said arm and therewith secure the screw (31) against rotation.

2. A projector holder according to Claim 1, **characterised** in that the connecting element (2) includes a screw (21) and a nut (24) which co-acts with said screw (21), of the connecting element, wherein second ends (12) of respective arms (1) include an elongate slot (13) through which the screw (21) of said connecting element (2) extends, and wherein the screw (21) of said connecting element extends through slots (13) such as to enable a stack of arms (1) to be clamped stably to the connecting element.

3. A projector holder according to Claim 2, **characterised** in that the slots (13) in respective arms are open towards said second end (12) of the arms.

4. A projector holder according to any one of Claims 1-3, **characterised** in that the arms (1) have generally a flat cross-sectional profile so as to support stably against each other in the connecting element (2).

5. A projector holder according to any one of Claims 1-4, **characterised** in that the arms (1) are generally straight, so as to extend generally radially to the screw (21) of the connecting element that carries the tightening nut (24) of said element (2).

6. A projector holder according to Claim 5, **characterised** in that the further screw (21) of the connecting element (2) includes a shoulder (22) that supports against an adjacent arm (1).

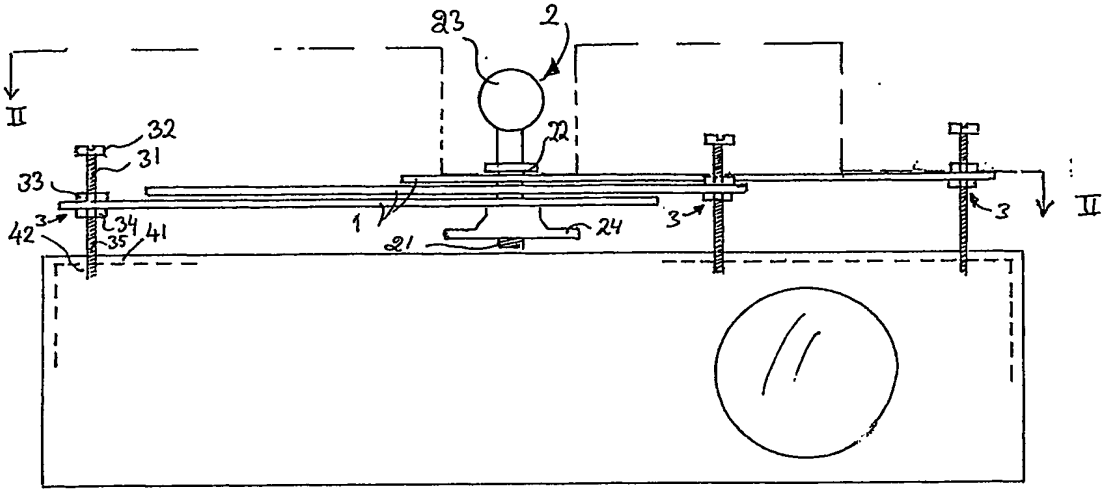
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FIG 1

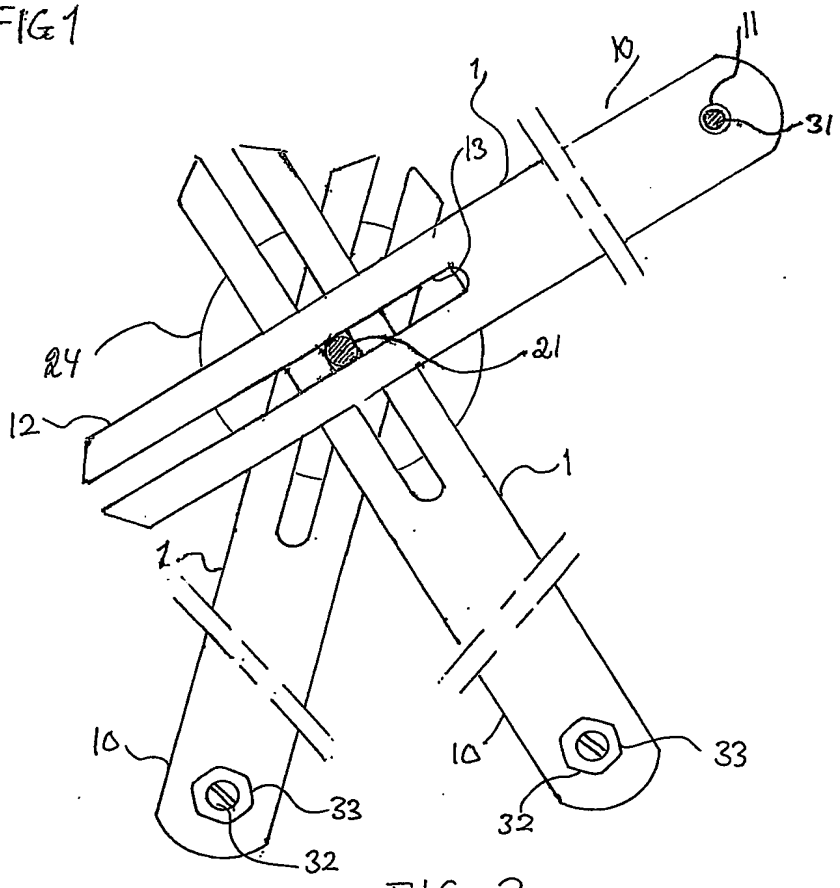
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FIG 2.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/000340

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16M 11/04, F16M 13/00, G03B 21/54
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16M, G03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5938161 A (TAKEUCHI ET AL), 17 August 1999 (17.08.1999), figures 1-10, abstract --	1-6
A	US 5551658 A (DITTMER), 3 Sept 1996 (03.09.1996), figures 1-5, abstract --	1-6
A	EP 0332762 A1 (NIXDORF COMPUTER AKTIENGESELLSCHAFT), 20 Sept 1989 (20.09.1989), figures 1-5, abstract --	1-6
A	WO 0210634 A1 (HOPPMANN CORPORATION), 7 February 2002 (07.02.2002), figures 1,2, abstract --	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 April 2004	11 -06- 2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan-Axel Ylivainio / JA A Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (January 2004)

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